

TRANSVAAL SEA-LEVEL TEMPERATURES.

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(Plates X.-XII.)

The reduction of plateau temperatures to sea-level temperatures is a problem that does not admit a definite solution. On land-surfaces both insolation and radiation are more active than on water-surfaces, so that the variation of temperature on the former is much larger. The endeavour of the present paper is to present figures showing the reduction of Transvaal High Veld temperatures to sea-level. The figures are based on two years' means of shade temperatures published by the Transvaal Meteorological Department in its Annual Reports for 1904-05 and 1905-06. The results are independent of any hypothesis. The problem was presented thus: What reductions applied to the Transvaal temperatures will in the mean for the whole country reproduce the assumed temperatures at sea-level? The sea-level temperatures assumed are based on Buchan's results, as published in Bartholomew's "Meteorological Atlas."

On squared paper, with the y axis for altitudes and the x axis for temperatures, points were placed for the actual temperatures recorded at the different altitudes, viz., sea-level and from 460 feet to 6,300 feet, but there were only a few points for places lower than 3,000 feet, or higher than 5,700 feet. A curve drawn through these points to the point at sea-level approximated closely enough to a parabolic form; from this curve the reductions to sea-level were taken.

If it should appear that the sea-level assumption must be corrected by a certain number of degrees, it will be sufficient to apply the same correction to the Transvaal sea-level reductions. At the same time I do not consider that the tables given are final: they must be considered as a first approximation. Two years' means are an insecure foundation, and more work is wanted between the Transvaal and the sea-coast so as to fix the reduction to sea-level for intermediate heights. But it is claimed that as a first approximation the table and maps which are given will be found

useful. If the maps are compared with Buchan's, it will be seen how different the isotherms are. In our warmest month Buchan gives as the sea-level temperature of the western border of the Transvaal something like $92\frac{1}{2}^{\circ}$, whereas it is actually 85° . In the absence of data, Buchan must have relied on the analogy with other continental areas, but the plateau effect and the still more potent effect of great wind movement, which is so marked a feature of South African Meteorology, greatly alter circumstances. Again, the forms of the isotherms in the mean and in the cold season deviate quite widely from Buchan's.

The table and maps which follow are so simple that they do not call for much explanation. The table shows the amount of the reduction of temperatures observed at each 500 feet of altitude. Below 2,500 and above 6,000 feet the figures are derived by extrapolation except for column two, which shows the hypothetical cooling of still dry air. It is seen that in our coldest and driest month there is some little approach to hypothetical conditions. The reduction in the warmest month, when the atmosphere is dampest, both actually and relatively, is always less than half of the still-dry-air figure.

Three maps show the distribution of sea-level temperatures during the warmest and coldest months of the year and for the mean of the year.

REDUCTION OF OBSERVED TEMPERATURES (TRANSVAAL) TO SEA-LEVEL TEMPERATURES.

Altitude in Feet.	Still Dry Air.	Coldest Month.	Mean Temperature.	Warmest Month.
0	+ 0 ^o ·0	+ 0 ^o ·0	+ 0 ^o ·0	+ 0 ^o ·0
500	2·7	2·0	1·8	1·0
1,000	5·4	4·0	3·4	2·0
1,500	8·1	6·0	4·9	3·0
2,000	10·8	7·9	6·3	4·0
2,500	13·5	9·8	7·7	5·0
3,000	16·2	11·7	9·0	6·0
3,500	18·9	13·5	10·3	7·0
4,000	21·6	15·3	11·6	8·1
4,500	24·3	17·0	12·8	9·3
5,000	27·0	18·7	14·0	10·7
5,500	29·7	20·3	15·2	12·2
6,000	32·4	21·8	16·4	13·8
6,500	35·1	23·3	17·6	15·5
7,000	37·8	24·7	18·8	17·3